[LOG 4] THE IMPACT OF INTELLIGENT TRANSPORTATION SYSTEM (ITS) ON EFFICIENCY OF LOGISTICS ACTIVITIES

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ABSTRACT

The main purpose of this study is to identify the impact of intelligent transportation system (ITS) on efficiency of logistics activities. In addition, the purpose is to show in what way the ITS impact on efficiency of logistics activities functions and performance. Based on the conceptual model theory by the Toyli et al. 2008, that the efficiency of the logistics provider services had to been determined by costs, quality and service performance. The model will be tested, what is the effect when the Intelligent Transport System (ITS) is implemented. In logistics services, the company obligate to the cost, quality and the performance they perform toward the customer. Delivering service that fulfills the customer requirement will determine the quality and performance of logistics service provider. In order to find out the impact of ITS system on this model in term of performing efficient logistics activities, usage of transport information application and information communication technology in logistics related activities had been observed. Our population and sample of study will be at the Bukit Kayu Hitam area. Five company from the seven teen logistic company had been selected. During conducting this qualitative analysis, we use the instructed interview as the main research instrument to collect the data. The interviewee will be the top management of the selected company. The top management is convenient for this research design because they have knowledge and expertise in overall business operation.Then the data were analyses by using reliability analysis, descriptive analysis, and correlation analysis to determine the impacts of Intelligent Transport System (ITS) on efficiency of logistics activities. . Intelligent Transport System (ITS) is the instrument used to determine the impact of Global Positioning System (GPS), Geographic Information Systems (GIS) and Advanced Information Systems toward efficiency of logistics activities. Besides, this research is to find out the relationship between Intelligent Transport System (ITS) on efficiency of logistics activities. Lastly, the survey regarding this study was constrained by the sample size and cross-section due to the time constraints.

Keywords: *Intelligent Transport System (ITS), efficiency of logistics activities, Global Positioning System (GPS), Geographic Information Systems (GIS), advanced information system*

INTRODUCTION

Intelligent Transportation System (ITS) is set of technologies applied to transportation infrastructure and vehicles to improve logistics activities in organization (Yang and Stough, 2010).The main objective of ITS is to evaluate, develop, analyses and integrate new technologies and concepts to achieve efficiency of logistics activities, improve environment quality, save energy, reduce of time, and improve safety. ITS in logistics activities aim to multimodal surface logistics system that will establish a connected transportation environment among vehicles, the infrastructure, and portable devices, such a cooperative setup leverages technology in order to maximize driver safety and mobility while improving environment performance and focusing on deployment, ITS involve all mode of transportation such as air, sea, road and rail, and interests various components of each mode to vehicles , infrastructure, communication and operational system (Vanajakshi, Ramaduri and Anandm, 2010).

Specially, Intelligent Transport Systems (ITS) in Malaysia, it is applications of advanced technologies like computers, sensors, controls, communications and electronic devices in transportation systems to save lives, time, money, energy, environment and the integration of information and communication technology with transportation infrastructure, vehicles and users.

In Malaysia, the Intelligent Transport System nowadays is not up-to-date enough, it's lacking of advances application system resources for the vehicles, infrastructures and human resources in order to achieve optimal performance in efficient way. The purpose of this paper is to explain what is ITS and how ITS impact to efficiency in logistics activities.

LITERATURE REVIEW

Efficiency of logistics activities

Logistics service is not about movement from point to point only, that is a part of it that call as transportation. From the other research, in part of the logistic services, transport it's a legal source sector that take or carry things from one place to another (Kashif Naseer Qureshi 2013). Council of Logistics Management (1991) defined that logistics is 'part of the supply chain process that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements'.

In term to deliver the best services to the customer, the demand of the customer must be fulfill. Instead of performing the services, what is the key role towards the efficiency logistics? In the business context, the action that we take, will giving the impact to the other things. The logistics activities involved the movement of product by using the transportation services. The global logistics already see this as a threat toward the environmental impacts. In term of providing the efficiency logistics services, the environmental cost also must be taken into account. These environmental impacts include pollutant emissions that lead to poor air quality, as well as energy consumption and green house gas (GHG) emissions. According to the research this transportation

sector is accountable of a significant amount of greenhouse gas emissions: 13% and 23% of CO2 emissions from fossil fuel combustion (ITF 2007).

Over the year this problem has been taking seriously by many people. As the business people who taking this as responsible, in recent year number of ITS program have been emerged, design to minimize the impacts.

Intelligent Transport System

In logistics industry, intelligent transportation system (ITS) is very important key to make sure logistics activities operate in efficient and effective. Due to its complexity, city administrators consider using Intelligent Transportation Systems (ITS) solutions as the basis for designing intelligent transport networks (Krzysztof Małecki et al. 2014).

The development of ITS has been the realization that further infrastructure construction could no longer be only tool to address the increase in logistics demand and the various problems that it inevitably creates. Therefore, to increase the capacity of logistics system by make them more efficient through an integrated use of the latest developments in various areas like infrastructure and logistics technologies, electronics, telecommunications, computing and operation method. Schumacher (2011) stated "logistics operations could be improved by enhancing the exchange of information and real time status updates regarding different business operations in different modes of transportation".

Advance Information Systems

According to Culnar and Markus (2010), advanced information systems are noted for their ability to store, process, manipulate, and accurately communicate vast amounts of data. Logistics information systems are used in every big company. This system help organizations enhance operational efficiency by tracking resources from when they are first obtained, for example, raw materials, to their purpose of utilization. Organizations influence these systems to pick up end-to-end visibility of their items or raw materials. Ballou (2013) stated that logistics information systems help organizations track internal data inside an organization by giving reports on inventory costs that decide the amount more stock should be obtained. This feature allows organizations to be more efficient by giving optimal lot sizes and lead times. Futhermore, logistics managers depend on advanced information systems to oversee and track materials, starting from when they are first made in the production line to when they are sold in retail locations. Subsequently, the expansion in volume and multifaceted nature that organizations confront, information systems are the best way to precisely manage the product flow within an organization. Information technology specialists are always coming up with specialized solutions that are suitable for their company like finding the right goods to market or finding the right routes for their trucks.

Global Positioning System (GPS)

According to Malladi and Agrawal (2002), GPS are space based radio positioning systems that provide 24-hour, 3-dimensional position, velocity and time information to suitably equipped users anywhere on the surface of the Earth .The GPS is more accurate system used in developed countries wherein a vehicle could be traced accurately with the help of Geo Stationary Satellites to the precision of one meter in terms of latitude and longitude. Once the position of the vehicle is known, it can be transmitted to consignor or consignee through the transmission organizes. Global Positioning System

is a best practice to provide real-time order status visibility to carriers, haulers and their customers alike. Mobile real time tracking of individual trucks area along with real time status visibility is accessible utilizing GPS to decide position of the trucks status data through web administrations to the portal.

Geographic Information System (GIS)

According to Mike Forster (2000), GIS are commonly defined by the processes that are carried out computer systems for capturing, storing, checking, integrating, manipulating, analysing and displaying data related to positions on the Earth's surface. Besides, GIS can be characterize as programming tools for visualization of special location of any element on earth which is stored in databases with geology .This could be regarding physical maps of the surface of earth, layout of inner surface of earth or a format of roads or streets. GIS is integration with GPS in utilized as a part of calculated operation for tracking and tracing of the consignment location to the extent of road or street in particular city. Users can interrogate these data based on their geographical relationships and show the results on a map, in a table or on a diagram. Well-known GIS products like ArcInfo™ and ArcView™ from ESRI, GeoMedia™ from Intergraph, MapInfo™ Professional from MapInfo Corp and GeoConcept™ from GeoConcept SA.

RESEARCH METHODOLOGY

The main purpose of this study is to identify the impact of intelligent transportation system (ITS) on efficiency of logistics activities. In addition, the purpose is to show in what way the ITS impact on efficiency of logistics activities functions and performance.

Since the studies were conducted on how the ITS impact the logistic activities, qualitative studies are deemed necessary where data are collected through series of interviews and focus groups (Sekaran and Bougie, 2009). During conducting this study, we use the instructed interview as the main research instrument to collect the data by using conveniently sampling. Table 1 indicates that all samples that are conveniently chosen based on Logistics companies in Bukit Kayu Hitam.

Table 1
Summary of chosen company

Company	Description	Position	Years in the Industry
Company A	Trading Agency Malaysia	Logistics Manager	12 years
Company B	İmport export shipping	Manager	8 years
Company C	Rendering of truck and transportation	Assistant General Manager	18 years
Company D	Offering global express distribution	Senior Manager	25 years
Company E	Goods Transportation Arrangement	Logistics Manager	7 years

The data collected for this study are obtained from primary sources, collected through instructed questionnaire and interviews the focus group interviews. According to De Ruyter (1996) and Sekaran and Bougie (2009) stated that focus group is a common tool for research discovering new phenomenon and for studies that are exploratory in nature. Sekaran and Bougie, (2009) stated that the method will avoid interviewee bias for not revealing true opinions or experiences.

The researcher's act as a moderator in the focus group. Sekaran and Bougie (2009) stated that the moderator plays a crucial role as he or she is the one responsible for introducing the topic, throwing the questions, observing, taking notes and recording the discussion. Recoding and transcribing the discussion are required to better analyze the discussion later (Hannabuss, 1996). Additionally, this study applies structured interviews as suggested by Sekaran and Bougie (2009) stated that it allows identification of several critical factors that might be central to the broad problem area.

The research hypothesis is created which are there is a relationship between Global Positioning System in efficiency of logistics activities, there is a relationship between Geographic Information System toward logistics activities efficiency or there is a relationship between Advanced Information System toward efficiency of logistics activities.

Accordingly, the interview questions are derived from the questionnaire and the reason why the answer is that, will be asking by interviewer. The interview questions are designed from the based on understanding and knowledge about the Intelligent Transport System. This is been done and cover all the impact and solution toward the issue related to the logistics activities.

DATA ANALYSES / FINDINGS

The problems faced by the respondents from the company were listed, compared and any repeated problems were removed from the lists. Table 2 shows the listing of problems faced in logistics sector. Based from the list, all problems are coded as PROBLEM and categorised into 3 group that coded as BARRIER by using thematic analysis . These BARRIER we assumed as the gate keeper for the logistic industries to achieved operation efficiency. These group are shown in Table 3, based on the resemblances of the problems and solution.

All problems encountered in logistics sector are categories into 3 group.The first group is labelled as BARRIER 1 consists of PROBLEM 1, 10 and 11, indicates the common problems in customer perspective such as lack of communication with customer. PROBLEM 2, 3, 4, 5, 7, 8, 9 and 12 are group in BARRIER 2 that specifies in opertion management perspective for example order picking issues and data recording leaking. Finally, BARRIER 3 is labelled as environmental perspective that indicates environmental issues in PROBLEM 6.

Table 2
Problems and solutions in logistics sector

Code	Problems Encountered	Solution (Intelligent Transport System)
PROBLEM 1	Lack of communication with customer	SKYPE (Advance Information Systems)
PROBLEM 2	Order picking issues	POINT OF SALE (Advance Information Systems)
PROBLEM 3	Delays of time delivery	FLEET MANGEMENT (Geogrpahic Information system, Advance Information Systems and Global Positioning System)
PROBLEM 4	Low safety and security of goods	COBRALINK (Global Positioning System)
PROBLEM 5	High cost of operating	FLEET MANAGEMENT(Geogrpahic Information system, Advance Information Systems and Global Positioning System)
PROBLEM 6	Environmental issues	FLEET MANAGEMENT(Geogrpahic Information system, Advance Information Systems and Global Positioning System)
PROBLEM 7	Communication failure with other department	POINT OF SALE (Advance Information Systems)
PROBLEM 8	Data recording leaking	MANAGEMENT SOFTWARE (Advance Information Systems)
PROBLEM 9	Lack in information of allocate resources	BOOK KEEPING SOFTWARE (Advance Information Systems)
PROBLEM 10	Lack of customer's reliabilty	ORDER MANAGEMENT (Advance Information Systems) ROUTE PLANNING (Geogrpahic Information system)
PROBLEM 11	Everchanging in customer needs	ORDER MANAGEMENT SYSTEM (Advance Information Systems)
PROBLEM 12	Unsupervise movement of trucks	COBRALINK (Global Positioning System)

Table 3
Categories of problem in logistics activities

Barrier 1 : Customer Perspective	
Lack of communication with customer	PROBLEM 1
Lack of customer's reliabilty	PROBLEM 10
Everchanging in customer needs	PROBLEM 11

BARRIER 2 : Operation Management Perspective	
Order picking issues	PROBLEM 2
Delays of time delivery	PROBLEM 3
Low safety and security of goods	PROBLEM 4
High cost of operating	PROBLEM 5
Communication failure with other department	PROBLEM 7
Data recording leaking	PROBLEM 8
Lack in information of allocate resources	PROBLEM 9
Unsupervise movement of driver's trucks	PROBLEM 12

BARRIER 3: Environmental Perspective	
Environmental issues	PROBLEM 6

DISCUSSION

BARRIER 1 indicates the issues within the customer relation management part. In order to operate efficiently in the logistics field the firm needs to focus also on the customer. In the marketing department, it's their purposed to keep the current customer and gain new customer. If the problem happened between the customer and company, the customer relation management need to seek a solution for the problem persisted. This issue has been exposed from the company A, B, C and D. By using the Intelligent Transport System the communication link between the company and the customer had been improved. Since used one of the Advanced Information System like Skype and Email, the communication with the customer and respond toward the customer need become easier. For example, Company C had a website as a medium to communicate between company and customers. This way makes ease to the customers to make order and also can know the location for their goods from the origin to the destination. This proved the flexibility and reliability of customer towards the company. Through the ITS technology like website or Skype, the company easily to fulfill the customer demand by knowing everchanging in customer needs.

BARRIER 2 discusses the management issue related to the operation. The representative of the Company B stressed that they had a problem in order picking before this. By using the Radio Frequency Identification system, the process of order picking, save more time than traditional method. The representative of Company E exposed the issues that they are currently facing on delays of time delivery. A good transportation planning can provide a solution or avoid the problem, for example the alternative road to cut the cost in term of fuel when the truck stuck in traffic jammed or if a problem happen with the current road, like the traffic jam or accidents, this alternative road can be determine by using the Global Positioning System or Geographic Information System. From the Company A, B and D representative, he

exposed about their safety and security of the good on transit. They handled this issue by using the Fleet Management Solution and Cobra link Global Positioning System to track the movement of truck and good. With the advanced used of Internet of Thing (Iot), the company can even lockdown the truck and the container if the truck is hijack by the criminal. For example, company A has using Remote Monitoring System to monitor their trucks from the origin to a destination so they will know what kind of route that used and also can estimate arrival time for their delivery. Besides, if anything happen to their trucks or cargo, it will automatically lock and only central can open it.

By using the Global Positioning System, the movement of the truck can be monitor time to time to check whether the movement still on the route or stop when not necessary. This proposed a solution to the unsupervised movement of truck issue that had been faced by the company A, B, C, D and E. The issue of communication failure between the department in the Company B, C and D also has been stressed by the representative that the different of information received by some other department. This affects their performances toward the customers. Using Advance Information System can improve the quality of communication and data sharing. This also proved that, the ITS avoid data leakage outside the company, by using a single server to save the private information or data. A single server used by the company, also improved the allocate resources of information by a single point only. For example company D had used single server to store all information so it make the operation operate in smooth. With the single server, they can ease exchange information between department and also store the useful data.

BARRIER 3 is the contribution toward the environmental issues. The environmental issue nowadays was really affected by the industry. In the logistics activities, the global logistics contribute a quite high ranking of pollution towards the environments. The Company E representative had revealed an issue regarding to the environmental perspective. If the truck had been stuck in traffic jammed, this will cost time and also the fuel. Without the alternative road or solution toward this problem, the truck can be stuck in the traffic around to 5 hour based on their experienced in Thailand. By using of Global Positioning system and Advance Information System, they can communicate with the driver easily and directly proposed a planning for solution like an alternative road to continue their journey. According to Logistics Manager of Company A, the company still using 45% paper for the documentation, but with Advanced Information system technology, they had reduced the usage of paper by using the Data Management System.

CONCLUSION

In conclusion, there are three problems encountered in efficiency of logistics activities namely customer perspective issue (BARRIER 1), operation management perspective issue (BARRIER 2), and environmental perspective issue (BARRIER 3). This all are problems that had been faced by 5 selected companies in Bukit Kayu Hitam during instructed interview. On the other hand, this research managed to come out with the impact of Intelligent Transportation System (ITS) on efficiency of logistics activities, there are several limitations need to be focused. Firstly, this research focuses on Logistics Company at Bukit Kayu Hitam, so this research needs a more evidence and findings to solve the issue. Secondly, the respondent to this research is a logistics

provider and the result had been avoided from biasness and lack of open mind towards the issue. In discussion, we can summarized that ITS are more importation in logistics activities of their company and also improved their company to meet customer satisfaction. In methodology, we show that the relationship between independent variable which are Global Positioning System (GPS), Geographic Information Systems (GIS) and Advanced Information Systems with dependent variable which is efficiency of logistics activities Therefore, the review of Intelligent Transport System (ITS) is increase efficiency in logistics activities, increase safety of transportation and also reduces environmental impacts of freight transportation. Finally, this research has limitation on time consuming and limited respondents. In future, Logistics industry needs a lot of research to have great views and revision for the Logistics development.

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